What Does Climate Change Mean for Illinois

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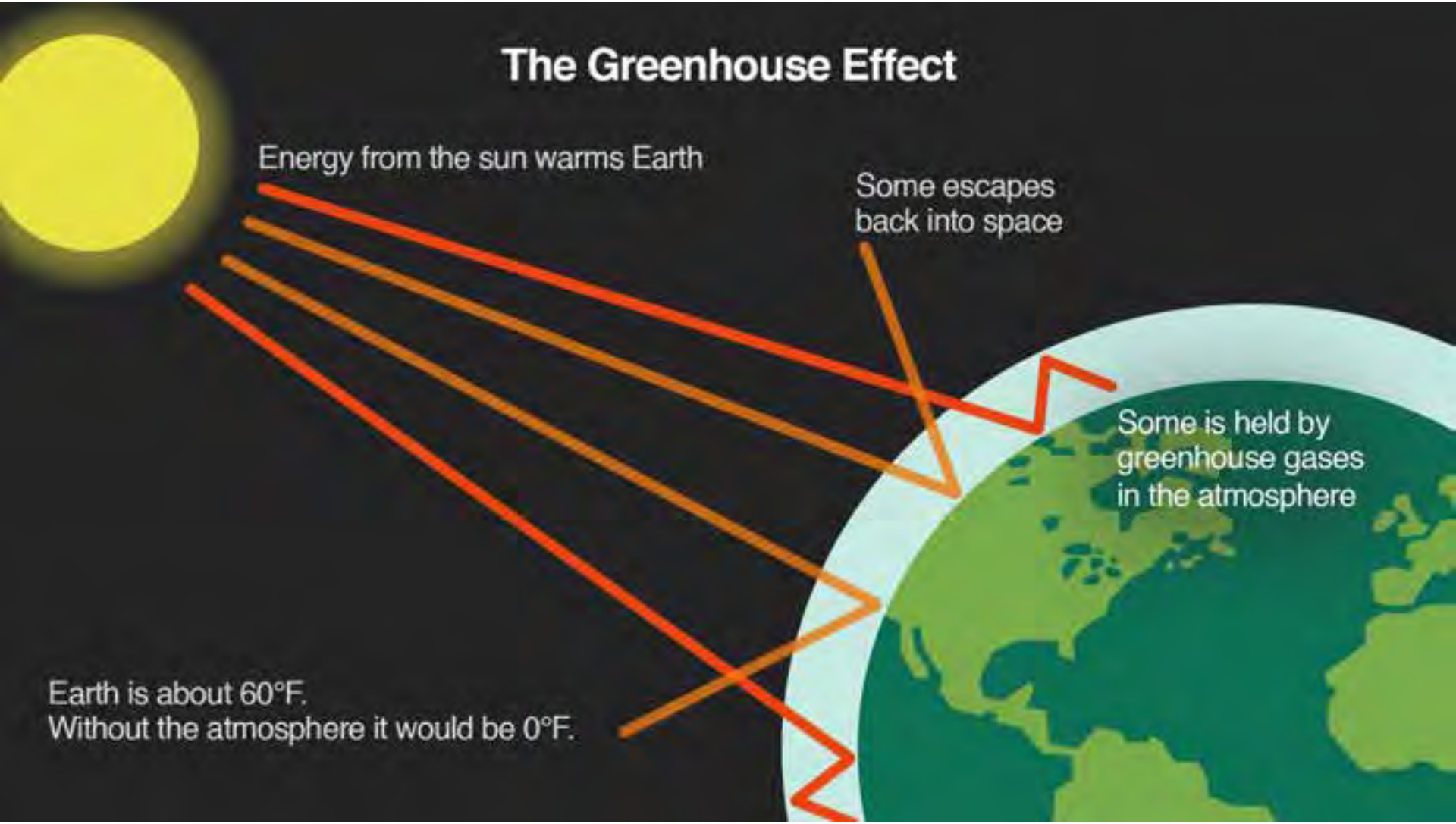
University of Illinois

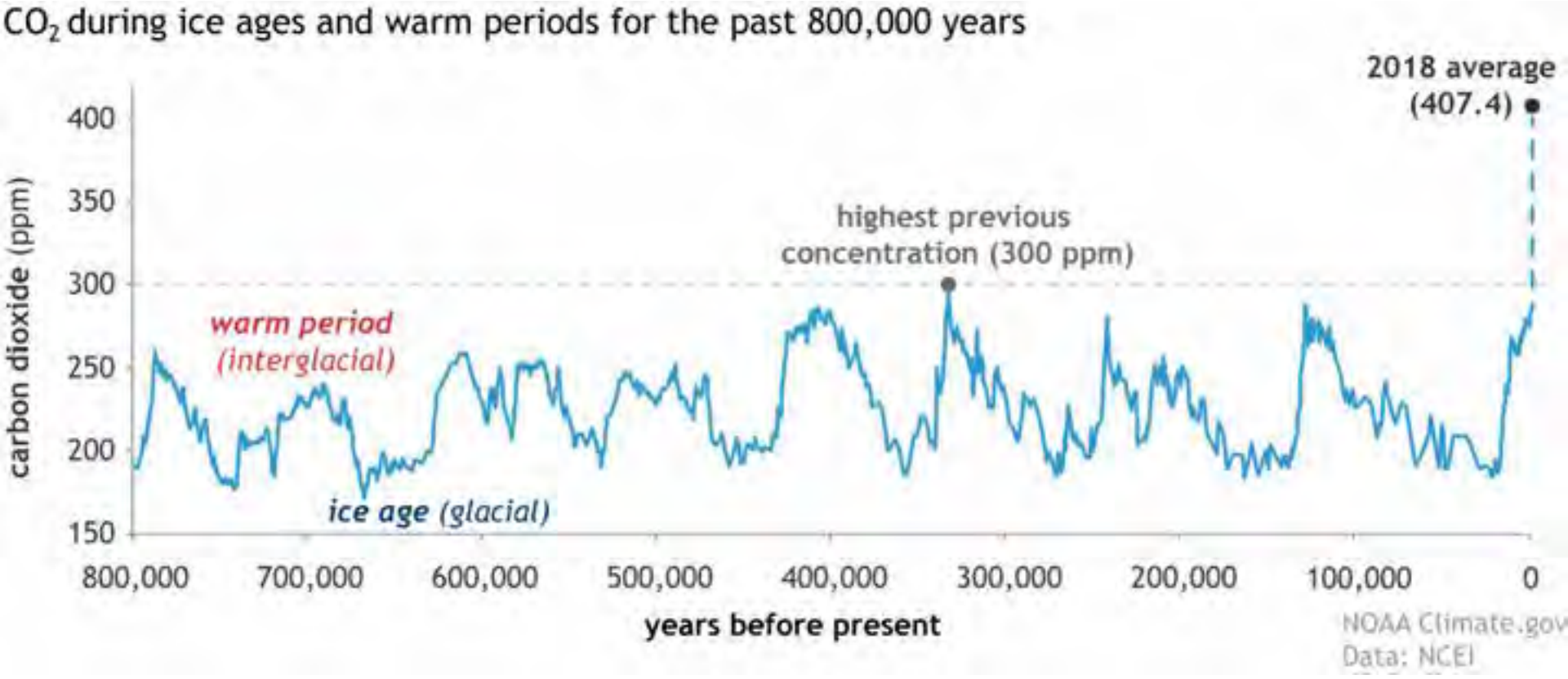
ILLINOIS

Climate Change Sources

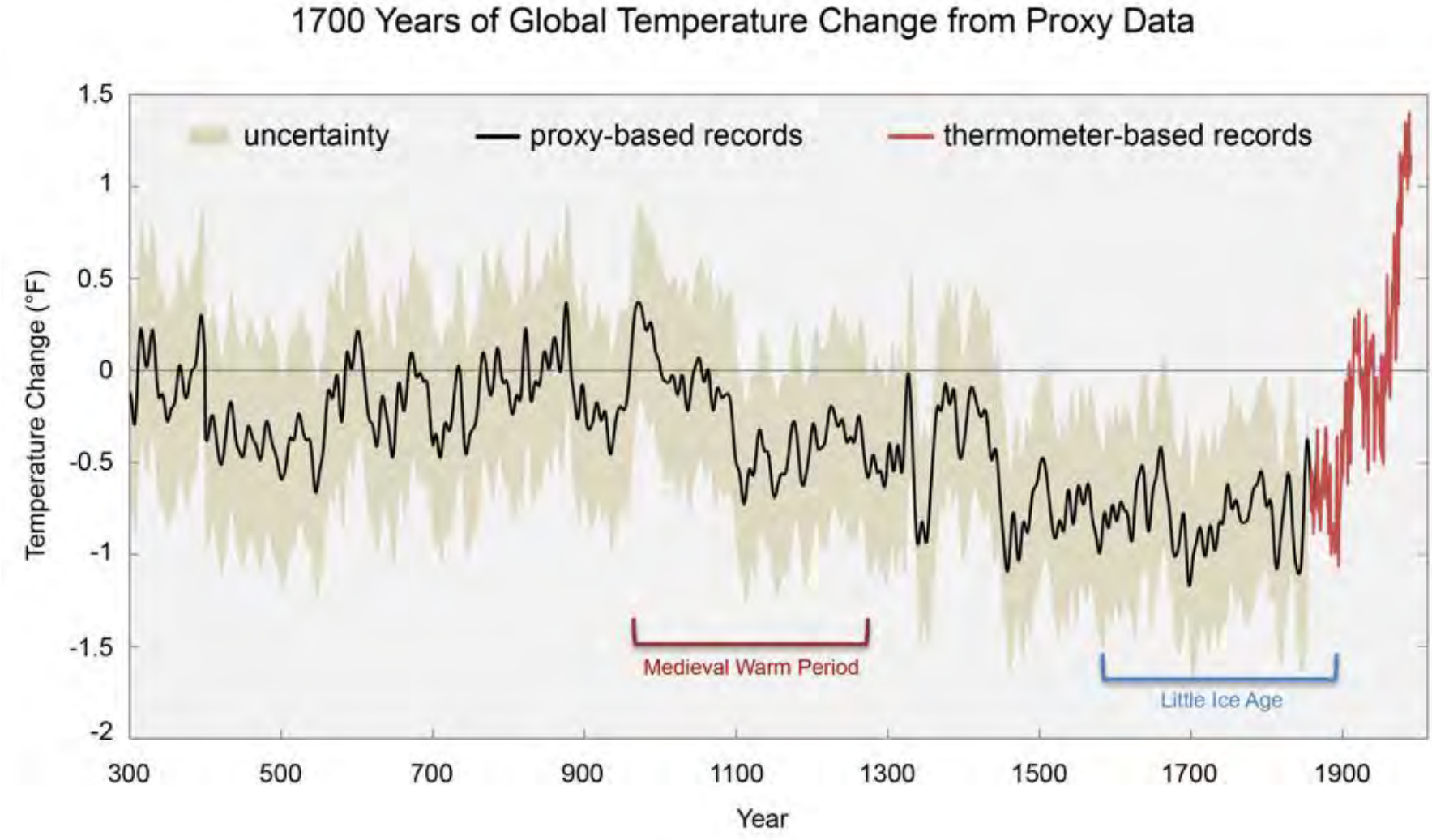
- Climate Science Special Report (2017)
  - https://science2017.globalchange.gov/
- National Climate Assessment (2018)
  - https://nca2018.globalchange.gov/
- State Climate Summary
  - https://statesummaries.ncics.org/



Source: Climate Central

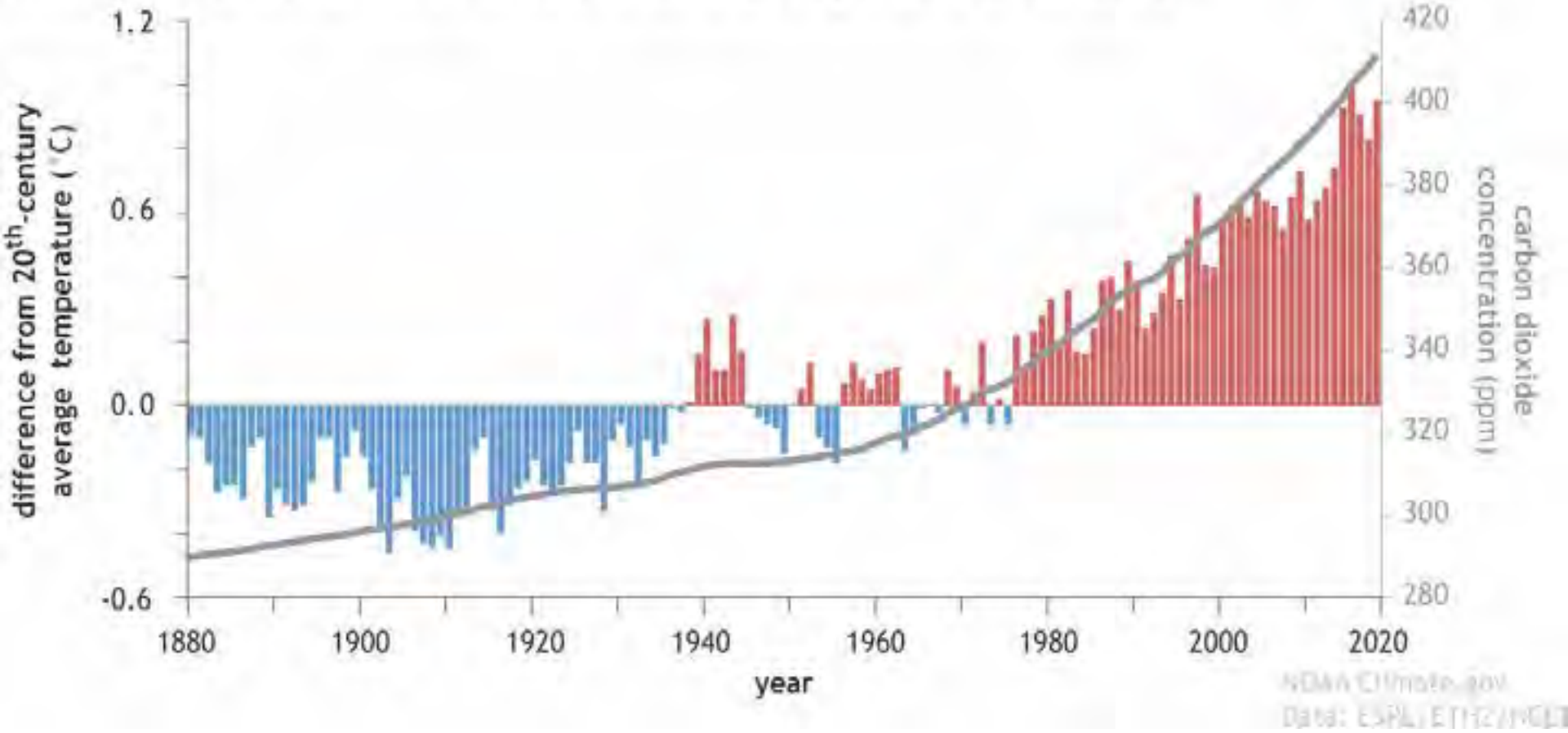


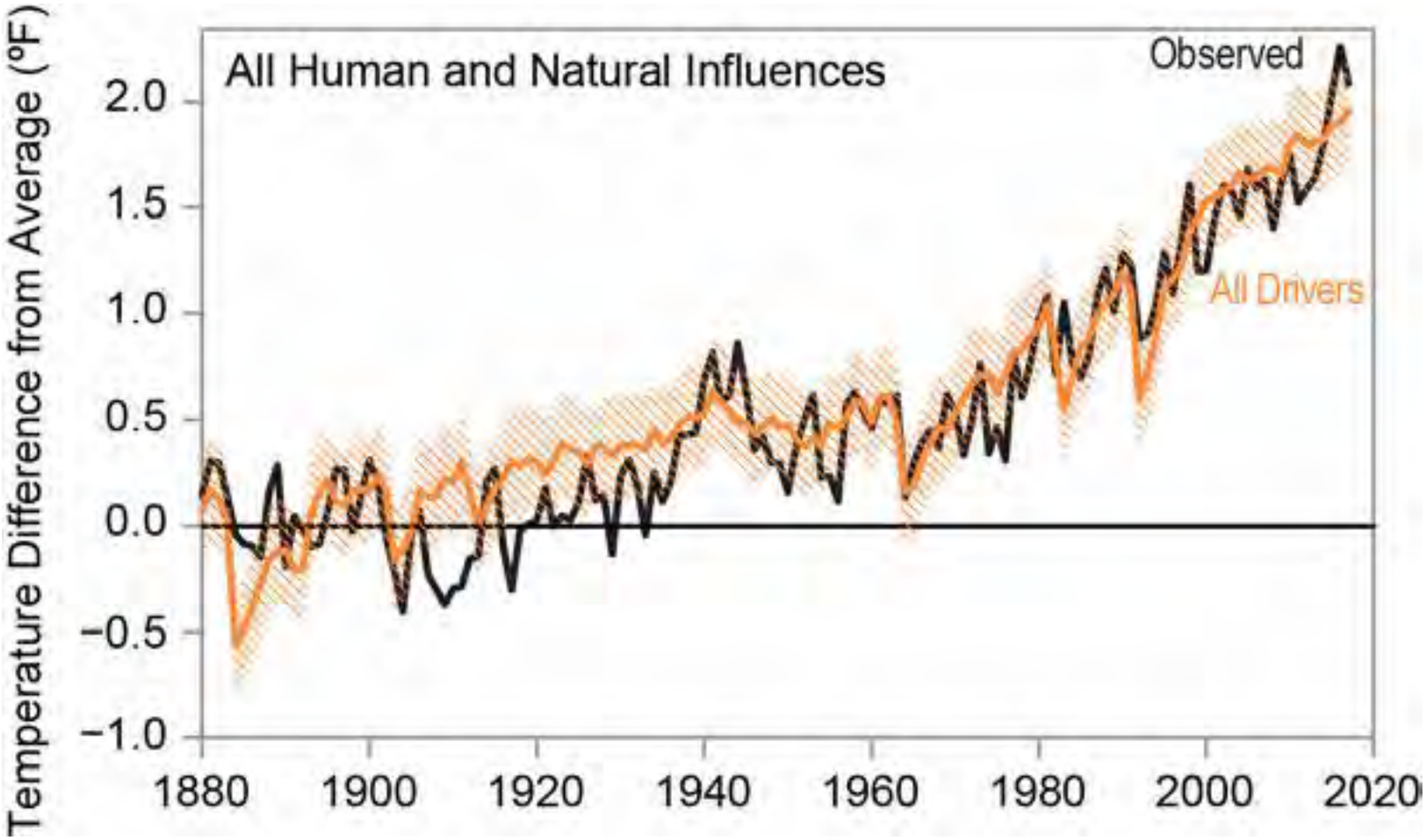
Global atmospheric carbon dioxide concentrations (CO_2) in parts per million (ppm) for the past 800,000 years. The peaks and valleys track ice ages (low CO_2) and warmer interglacials (higher CO_2). During these cycles, CO_2 was never higher than 300 ppm. In 2018, it reached 407.4 ppm. On the geologic time scale, the increase (blue dashed line) looks virtually instantaneous. NOAA Climate.gov, based on EPICA Dome C data (Lüthi, D., et al., 2008) provided by NOAA NCEI Paleoclimatology Program.

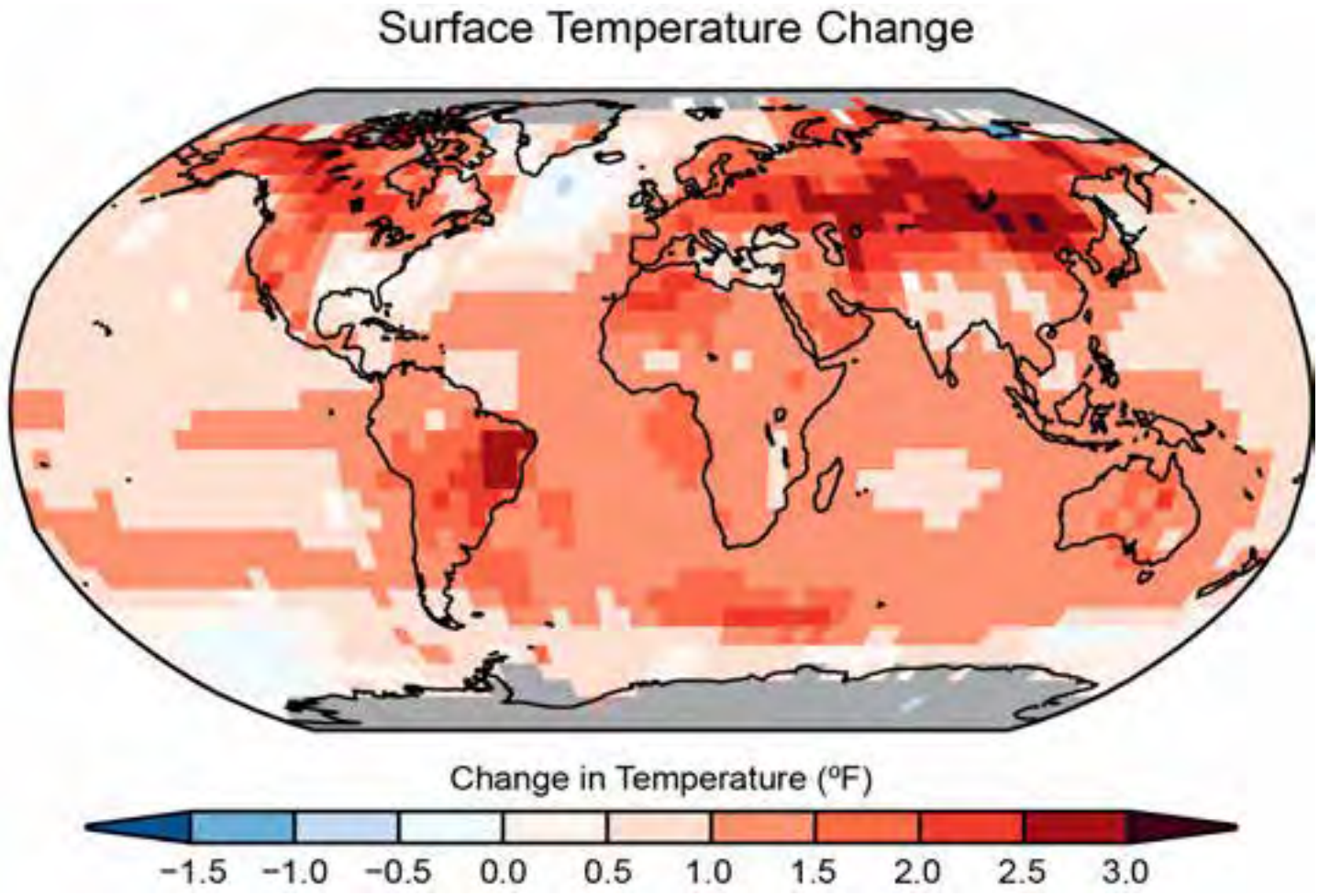


Studies of past climates suggest that current global temperatures were *likely* last observed during the Eemian period—the last interglacial—125,000 years ago.

Atmospheric carbon dioxide and Earth's surface temperature (1880-2019)

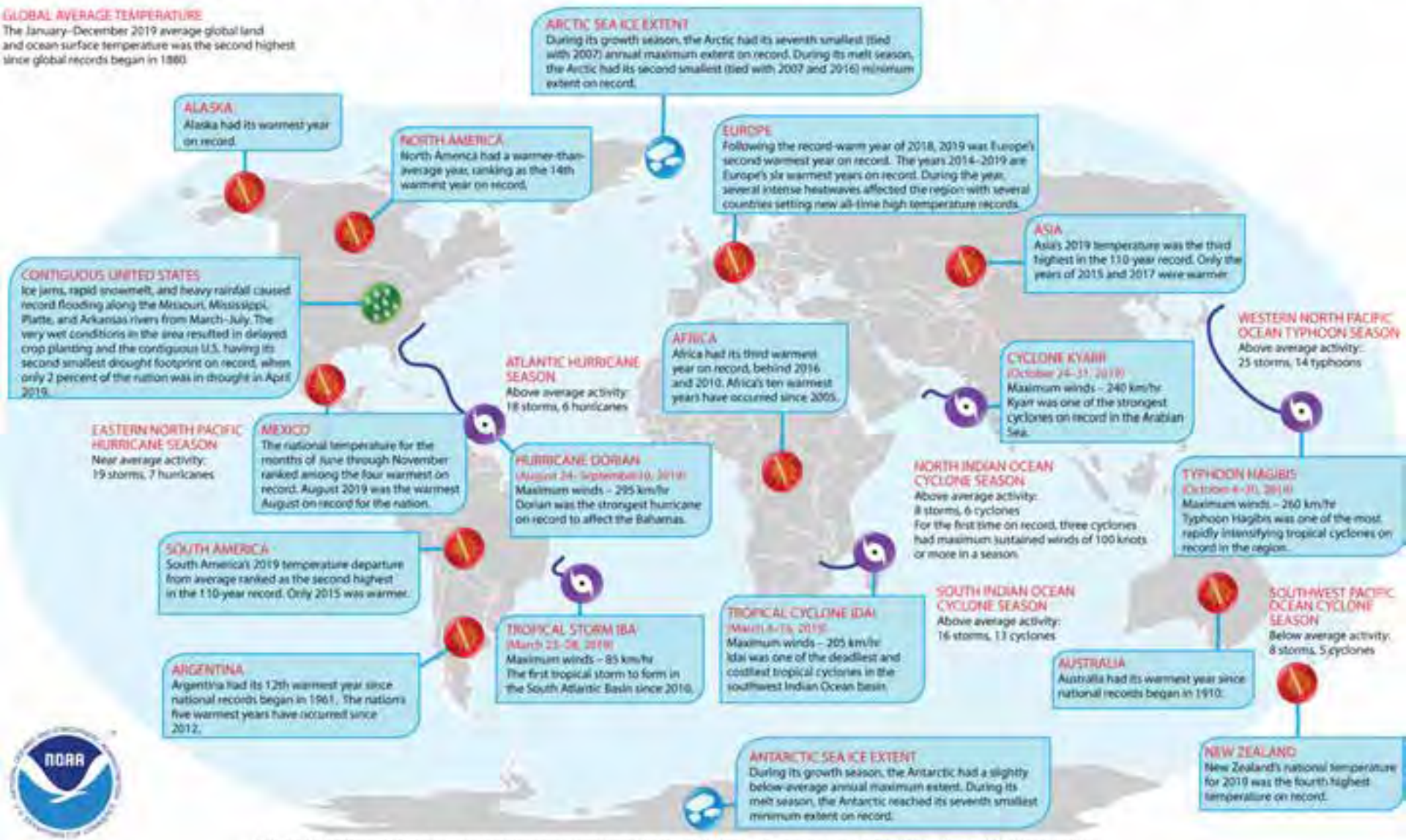



All Human and Natural Influences
Observed
All Drivers
Temperature Difference from Average (°F)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
1880
1900
1920
1940
1960
1980
2000
2020



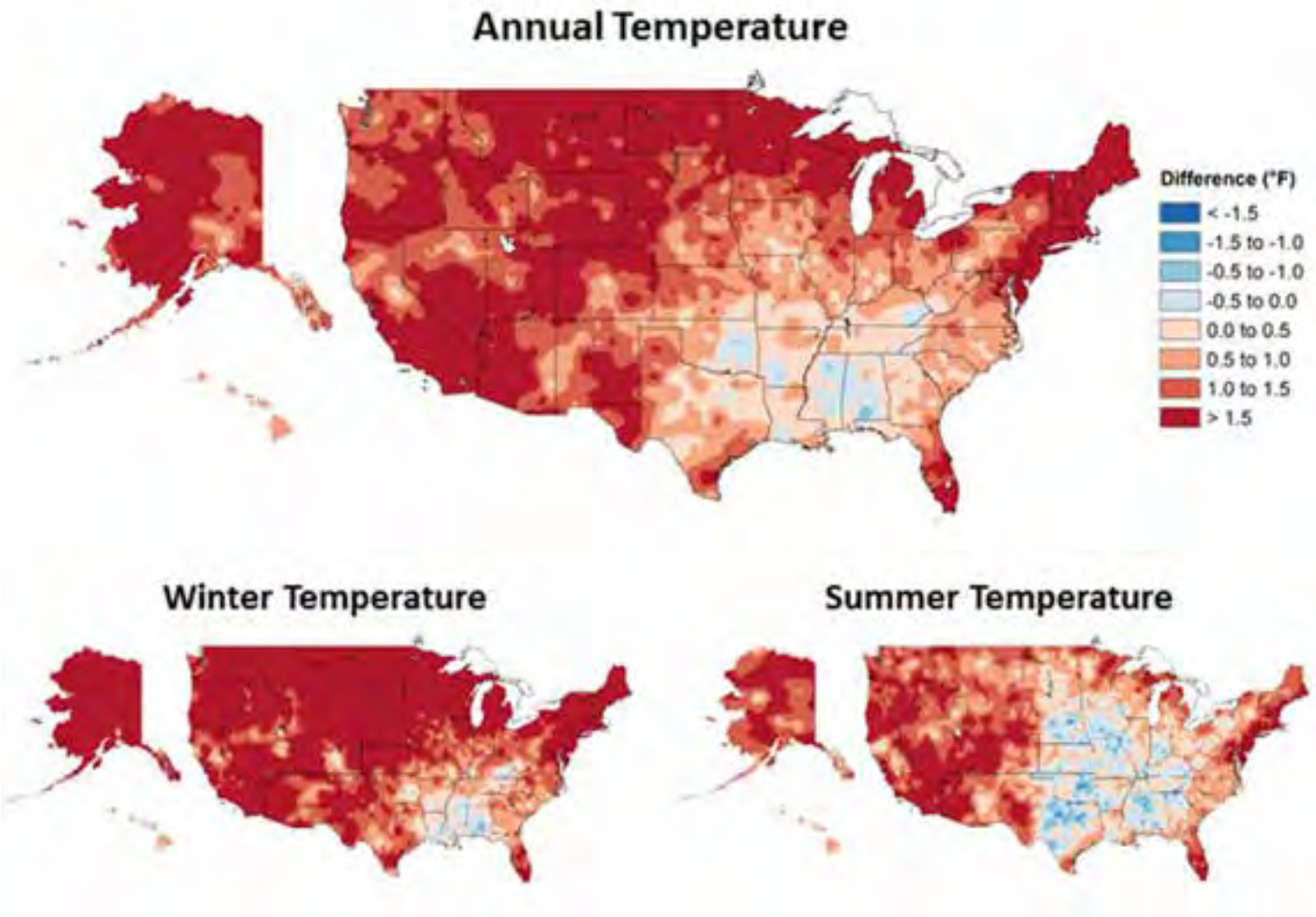
Caption: (left) Global annual average temperature has increased by more than 1.2°F (0.7°C) for the period 1986–2016 relative to 1901–1960. Red bars show temperatures that were above the 1901–1960 average, and blue bars indicate temperatures below the average. (right) Surface temperature change (in °F) for the period 1986–2016 relative to 1901–1960. Gray indicates missing data. *From Figures 1.2. and 1.3 in Chapter 1.*

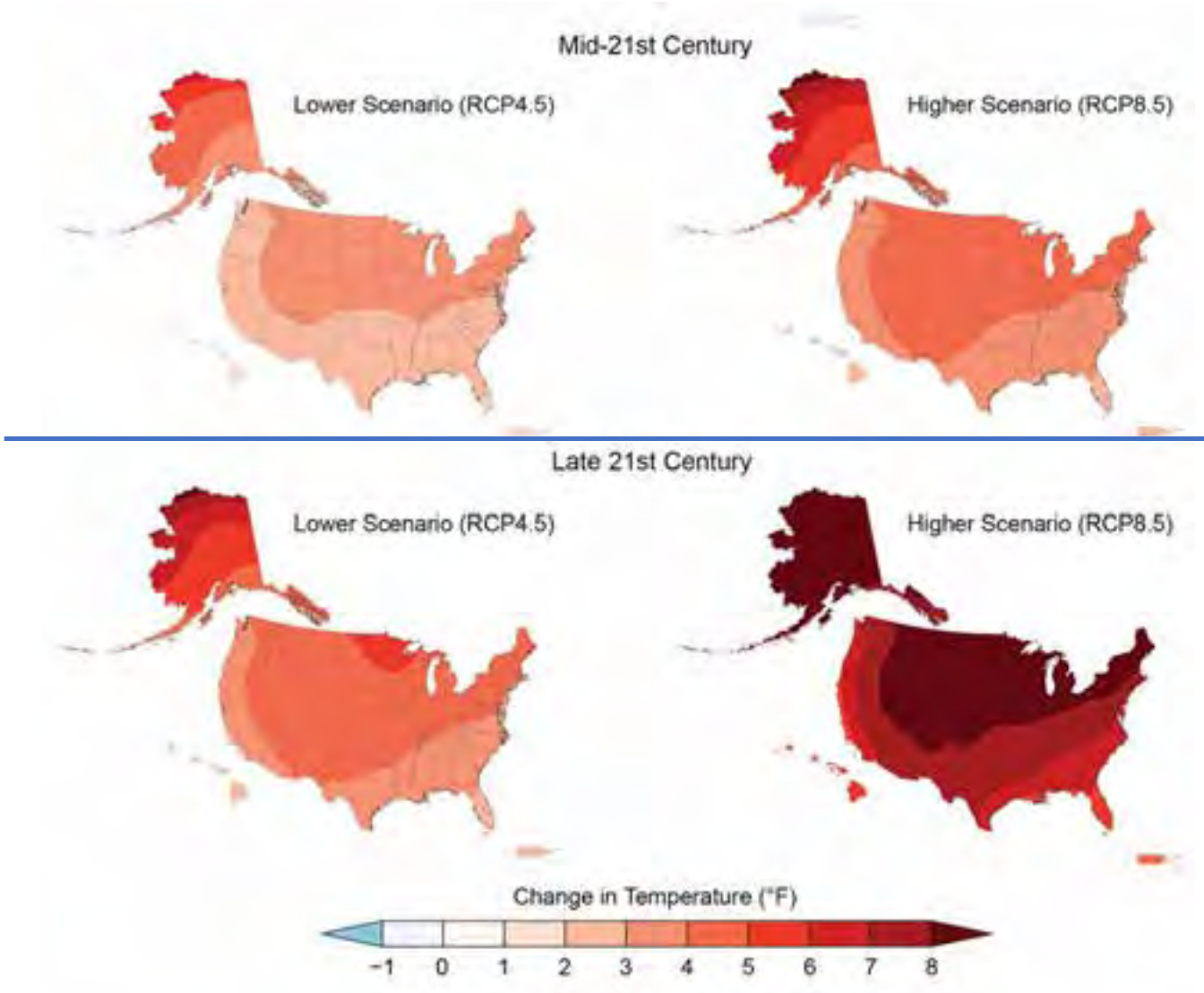
Selected Significant Climate Anomalies and Events in 2019



Please Note: Material provided in this map was compiled from NOAA's NCEI State of the Climate Reports and the WMO Provisional Status of the Climate in 2019.
For more information please visit: http://www.ncdc.noaa.gov/sotc

Observed changes in mean temperatures, 1901-1960 vs 1986-2016



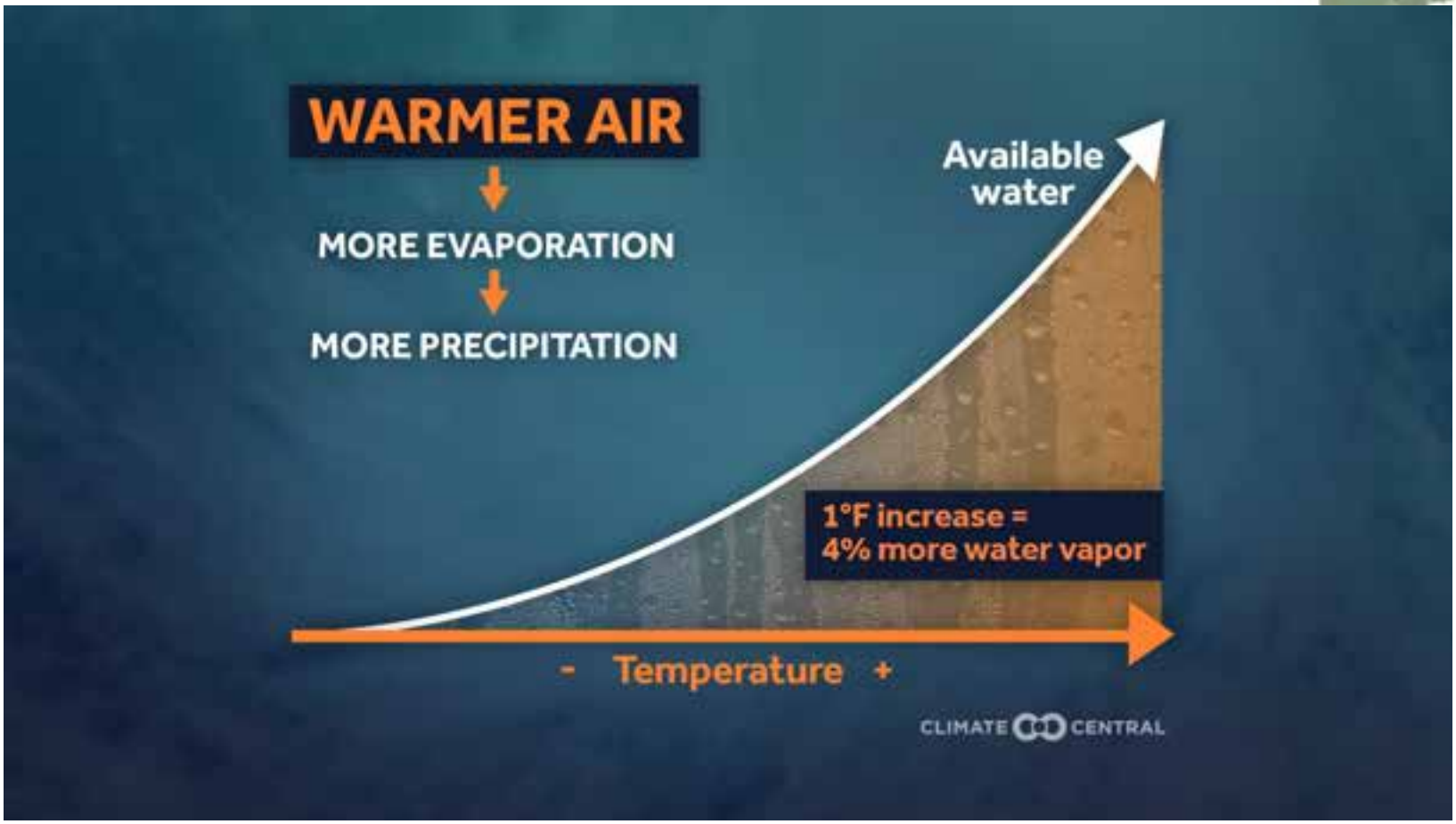


4 to 5°F increase (Midwest)

5 to 9°F increase (Midwest)

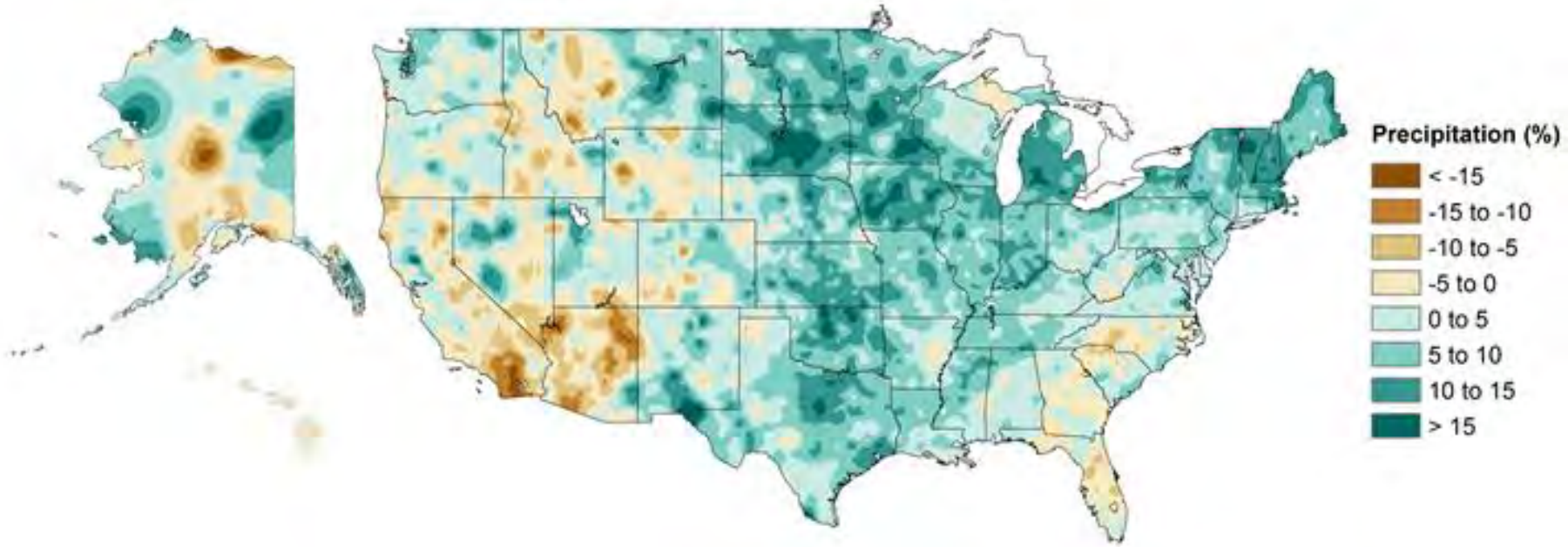
https://nca2018.globalchange.gov/chapter/2/

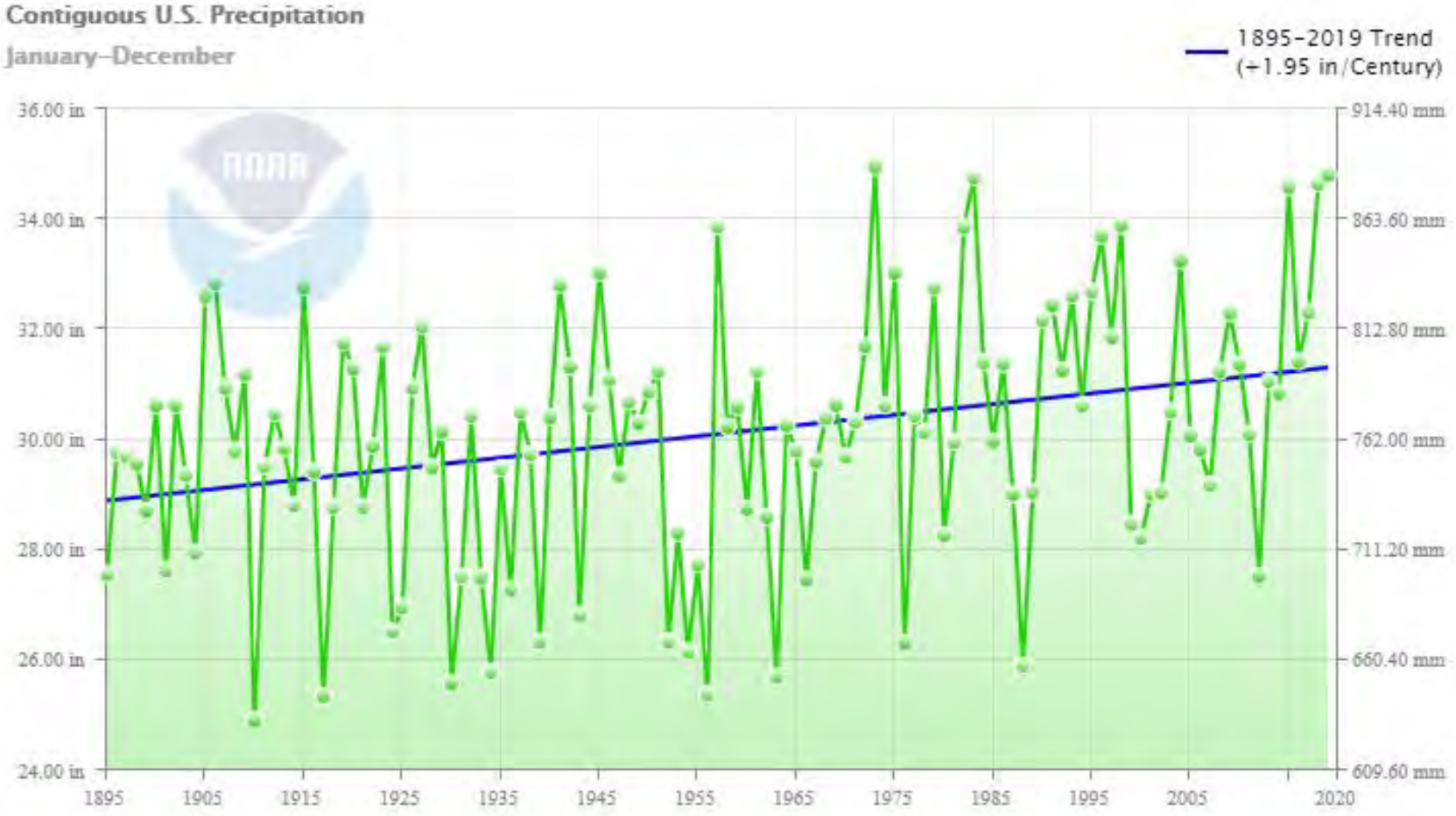
Increased Humidity

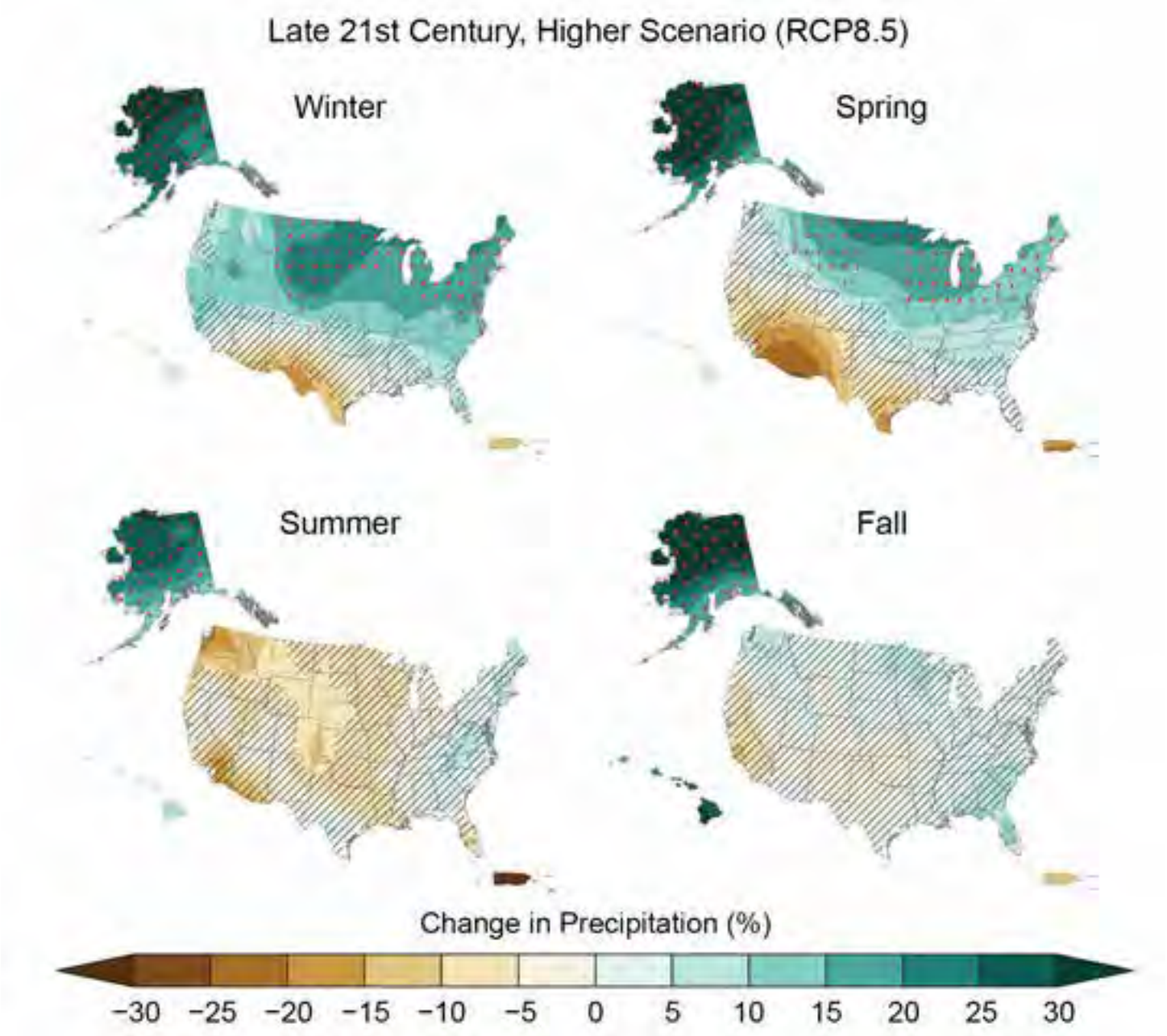


Increased Humidity

1986-2015 minus 1901-1960




Contiguous U.S. Precipitation
January–December
1895–2019 Trend
(+1.95 in/Century)
36.00 in
34.00 in
32.00 in
30.00 in
28.00 in
26.00 in
24.00 in
914.40 mm
863.60 mm
812.80 mm
762.00 mm
711.20 mm
660.40 mm
609.60 mm
1895
1905
1915
1925
1935
1945
1955
1965
1975
1985
1995
2005
2020


Late 21st Century, Higher Scenario (RCP8.5)
Winter
Spring
Summer
Fall
Change in Precipitation (%)
−30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30

2070-2099

- Volume I of the NCA4
- Precipitation will continue to increase (medium confidence)
- Heavy precipitation events will increase in frequency and amounts (high confidence)

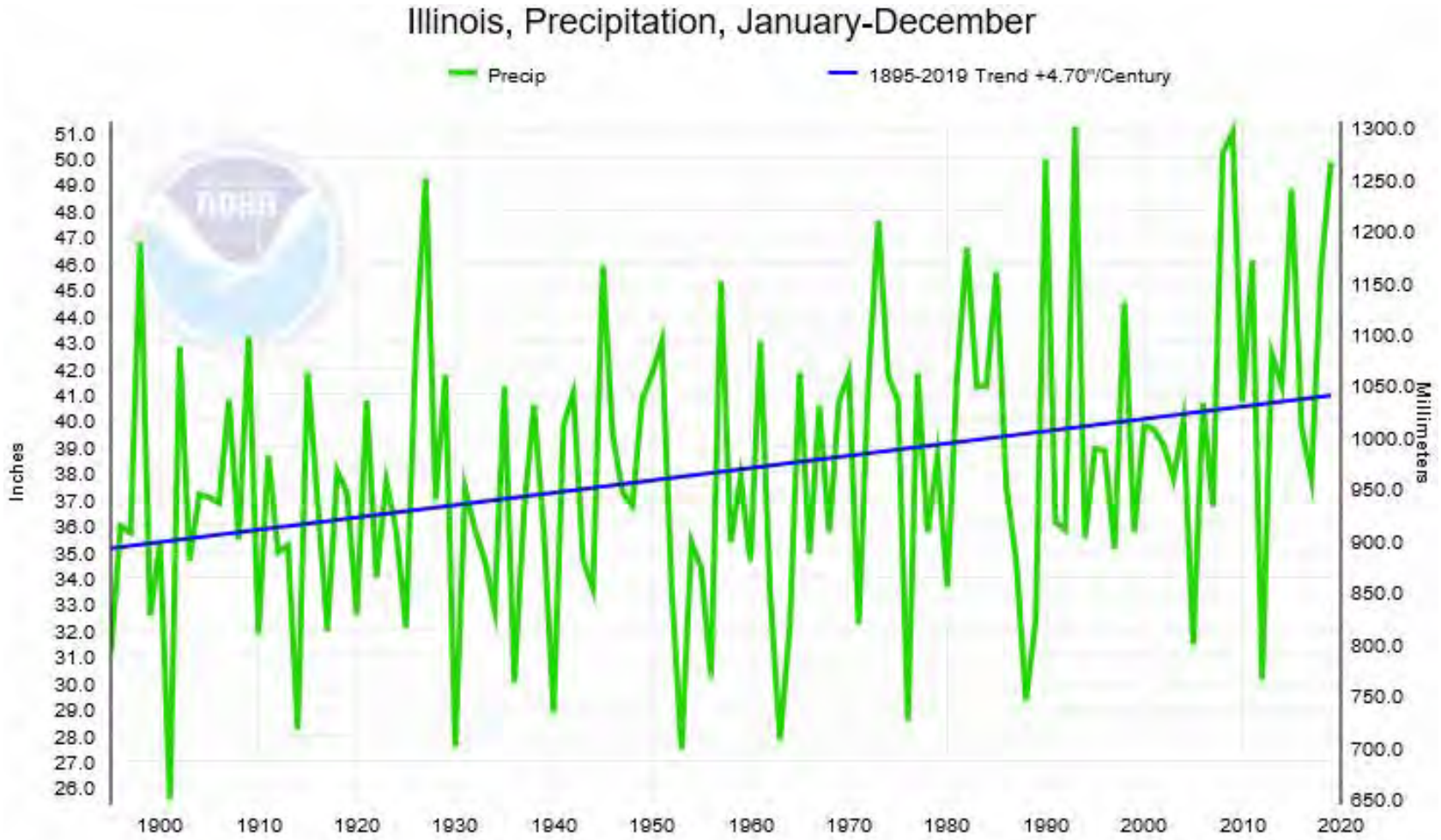
https://science2017.globalchange.gov/

Back to Illinois …

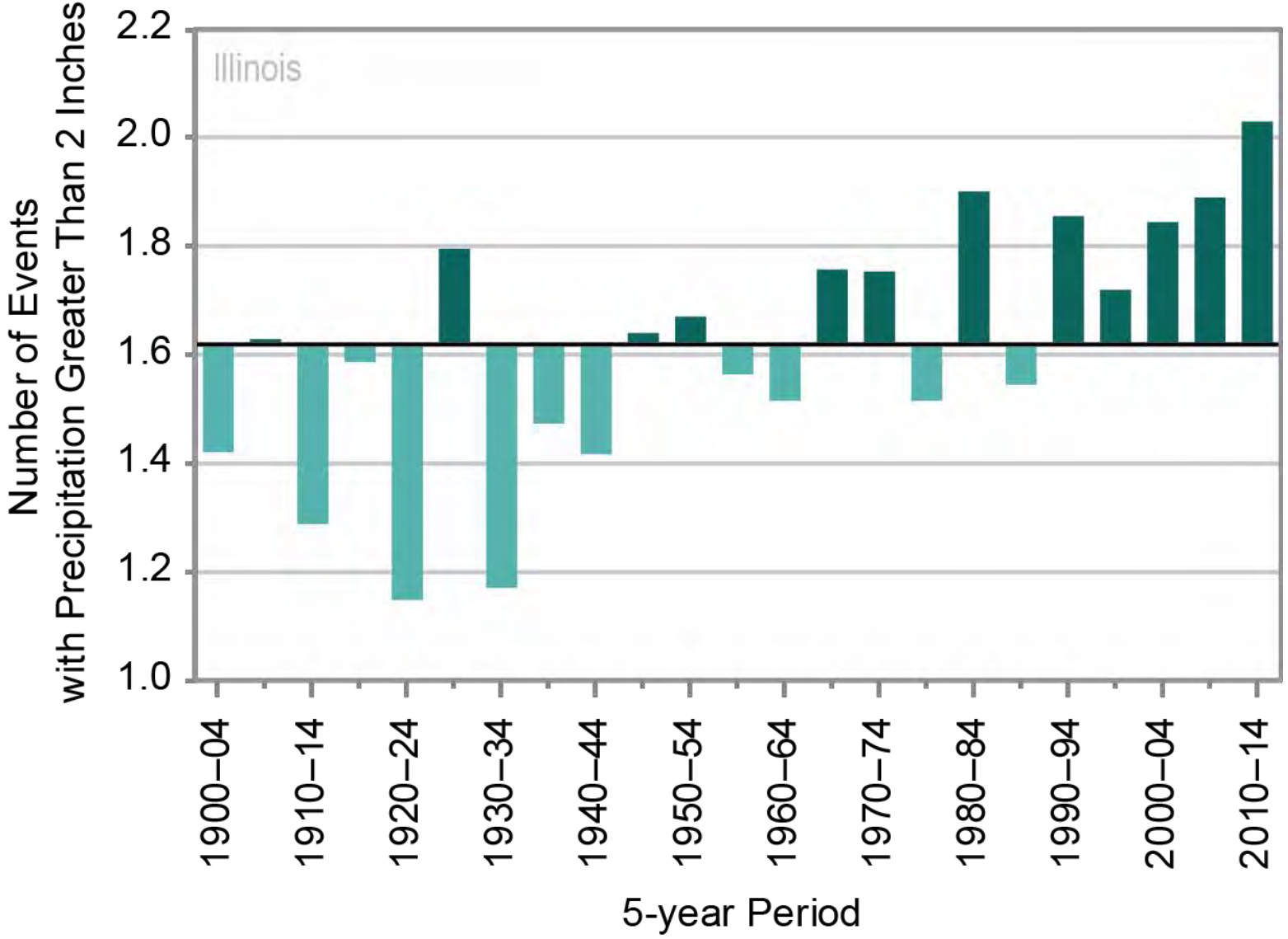
Diary of the Weather, Fort Armstrong, Rock Island

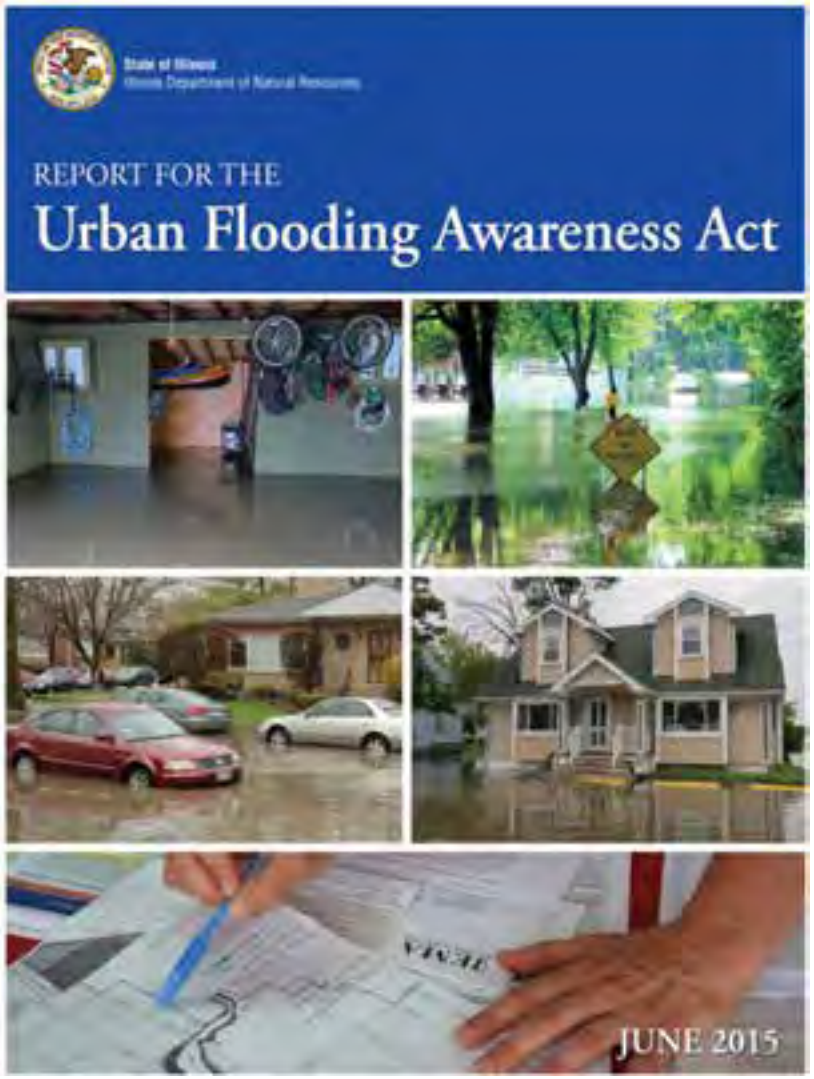
July 1820

Date 1820	Thermometer 7 A.M.	2 P.M.	9 P.M.	Course of the Winds	Weather	Remarks.
July 1	80	96	80	S. E.	Fair R2	I arrived at Fort Armstrong on the 9th of the Present Month; from the commencement tille my arrival the Diary was kept by Maj: Maston Commanding Officer.
2	78	90	86	Do	Do 24.	
3	80	80	70	Do	Cloudy 5	
4	66	80	72	S. W.	Do	
5	70	82	78	Do	Fair	
6	71	84	76	So.	Do	
7	77	90	82	S & S W	Cloudy	
8	77	92	82	S S W & W	Fair	
9	79	96	80	S S W & S W	Do	
10	78	96	84	E S W	Do	
11	81	84	81	W S W	Cloudy	
12	80	90	71	N W & W	Do	
13	58	78	67	N W & N	Fair	74.16 — 86.77 — 75.50
14	58	78	68	N N W	Do	
15	68	90	70	E & S E	Do	26.91 78.84
16	71	86	72	S E	Do	
17	76	90	82	S E & E	Do	
18	78	90	73	S E	Do	
19	76	88	74	S W	Do	
20	72	90	78	W by S	Rain, P M	
21	78	80	72	W S W	Do Do	A violent hurricane on the 21st.
22	70	88	66	S E	Fair	

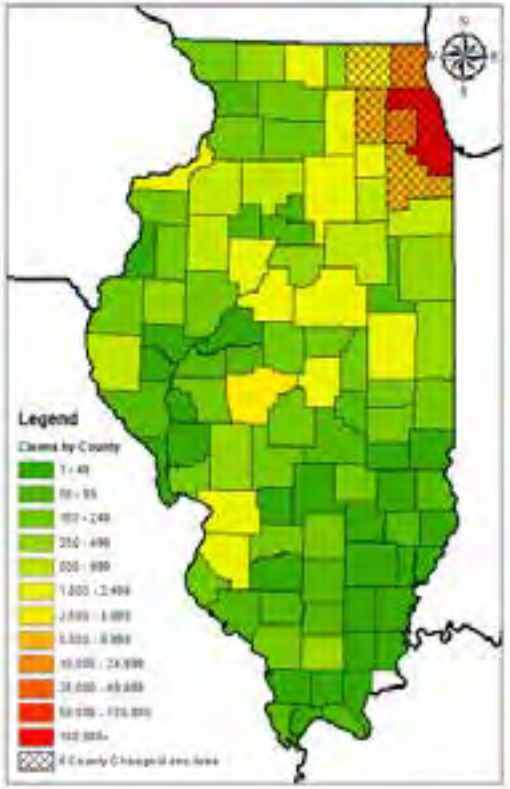

Illinois, Precipitation, January-December
Precip
1895-2019 Trend +4.70"/Century
Inches
Millimeters
51.0
50.0
49.0
48.0
47.0
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
34.0
33.0
32.0
31.0
30.0
29.0
28.0
27.0
26.0
1300.0
1250.0
1200.0
1150.0
1100.0
1050.0
1000.0
950.0
900.0
850.0
800.0
750.0
700.0
650.0
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020

Observed Number of Extreme Precipitation Events



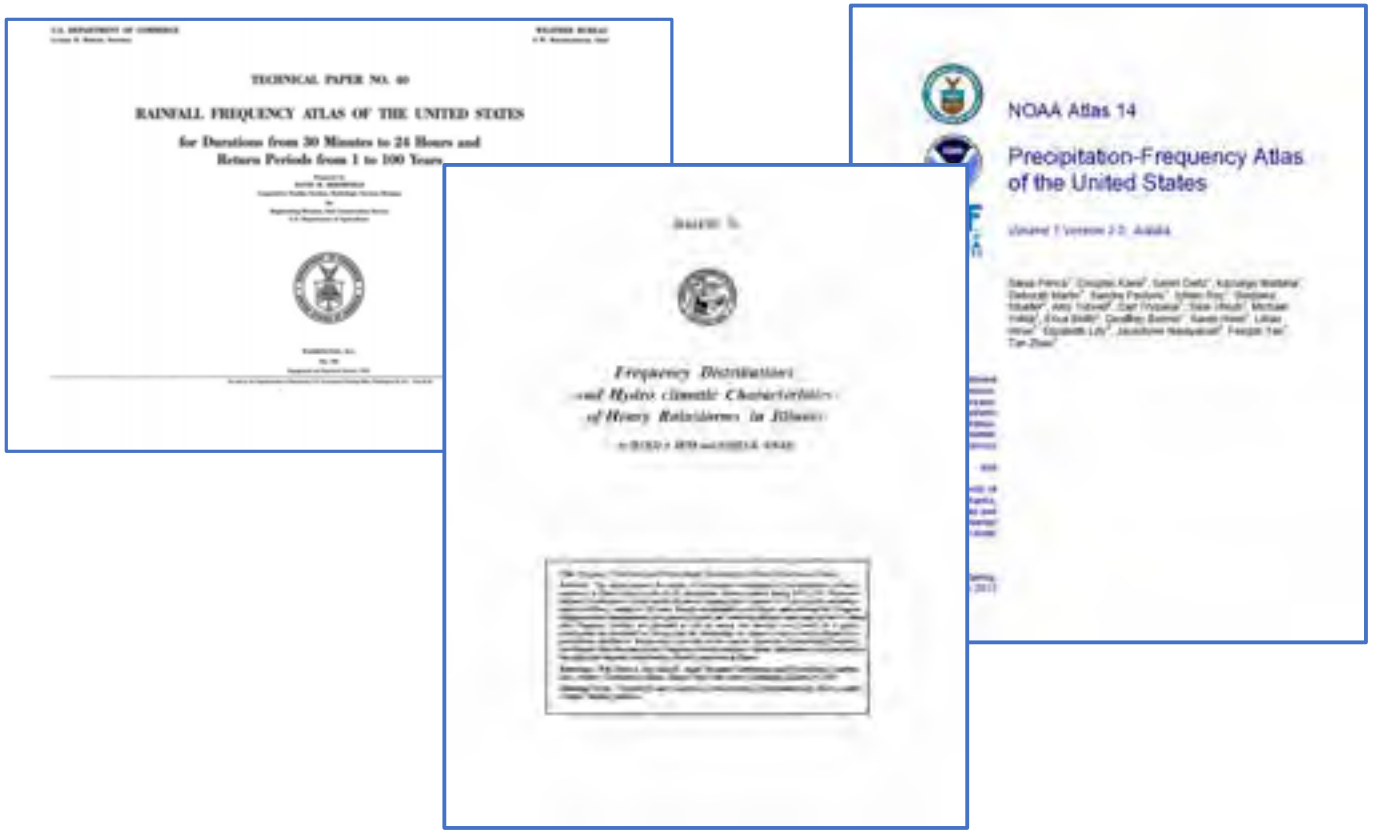


- Wetter climate
- Aging infrastructure
- Urbanization - runoff



Soil Erosion

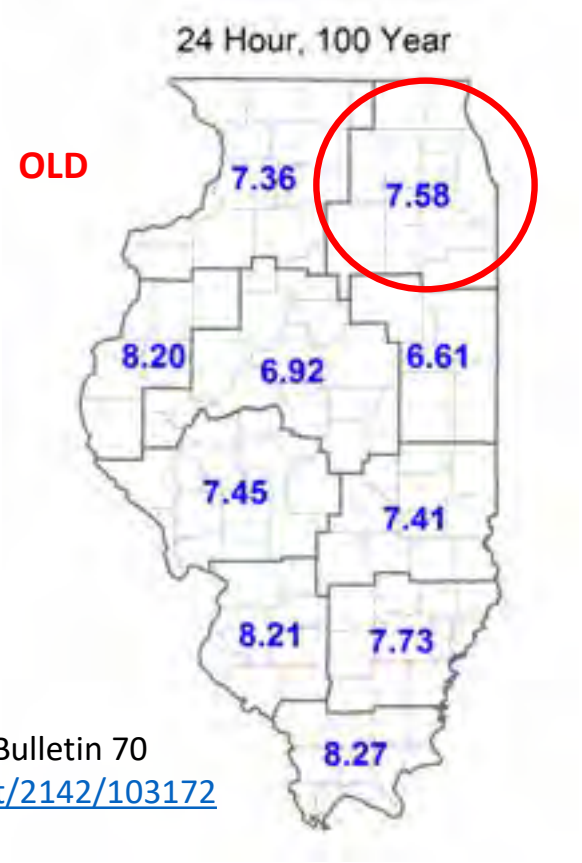
Rainfall frequency sources
TP-40, ISWS Bulletin 70, NOAA Atlas 14, ISWS Bulletin 75



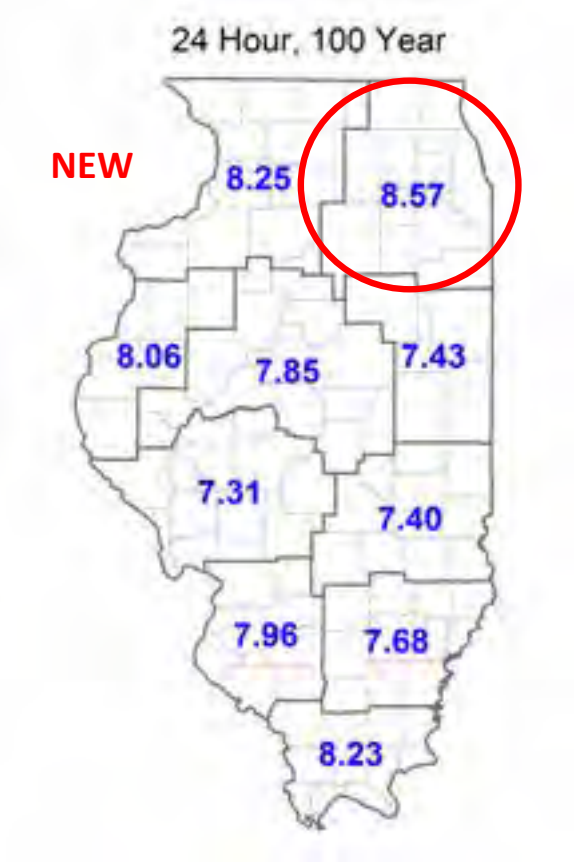
For example, the “100-year storm”

Old and New 100-Yr, 24-Hour Storm

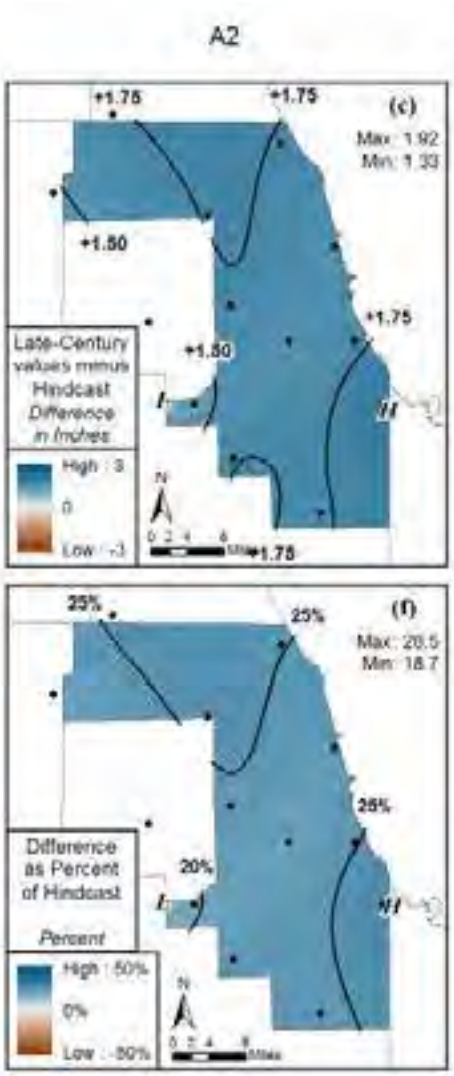
OLD



NEW



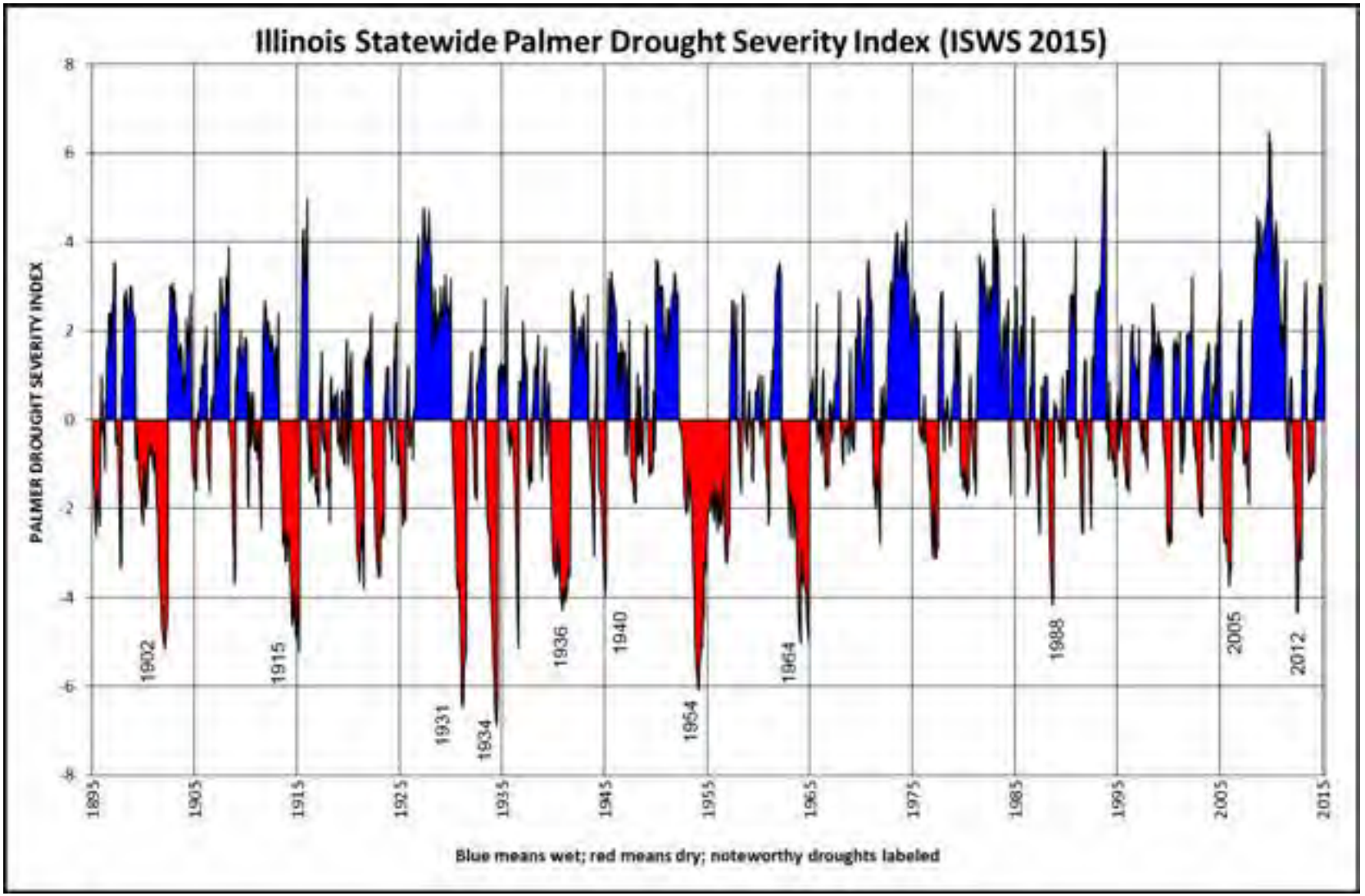
From the Update to Bulletin 70
http://hdl.handle.net/2142/103172

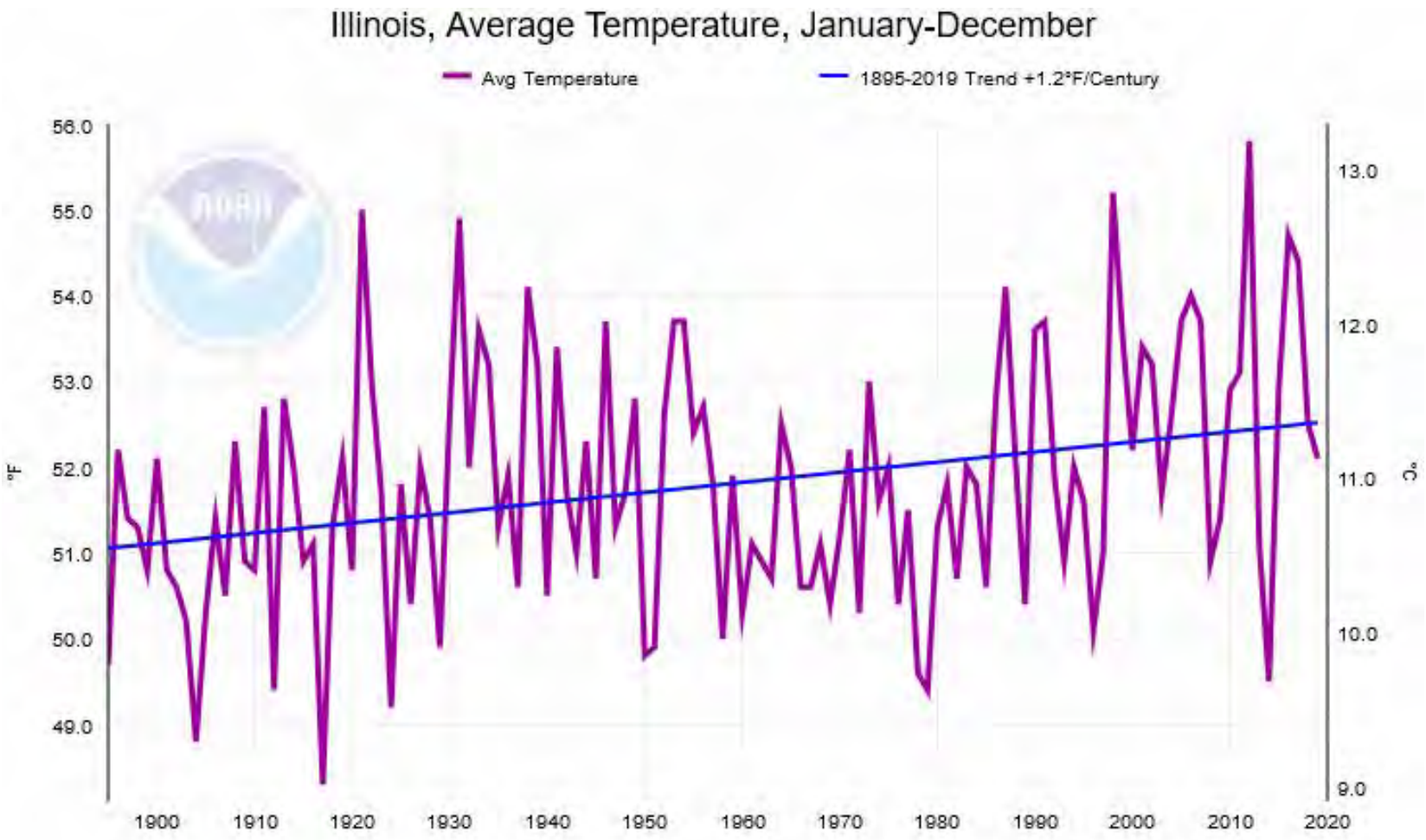


Modeled Increase in the late 21st Century 100-year, 24-hour storm based on a high emission scenario

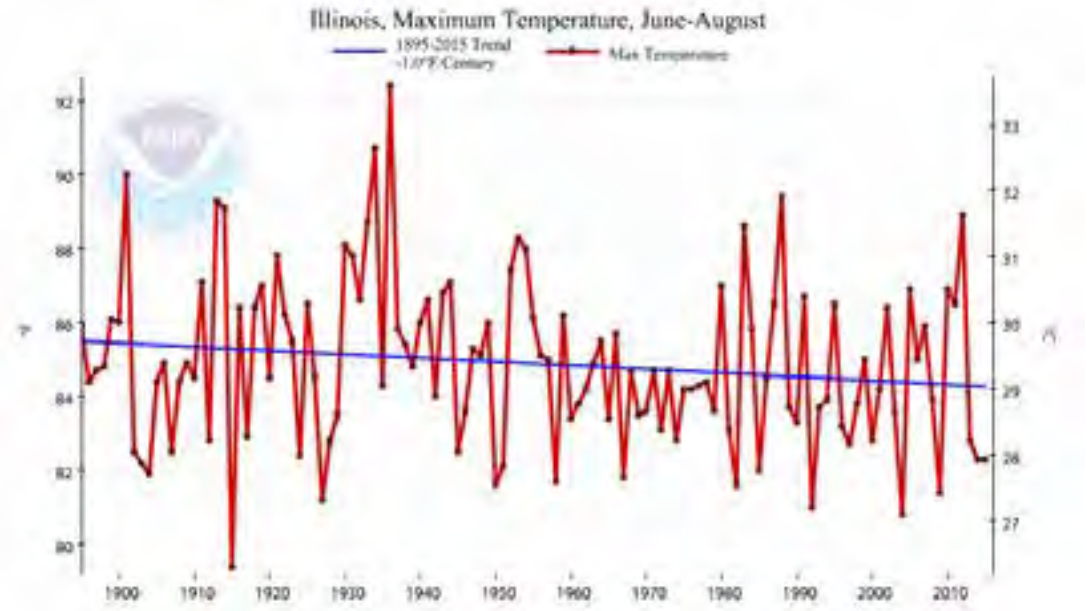
https://www.isws.illinois.edu/pubdoc/CR/ISWSCR2016-05.pdf

Illinois Drought History



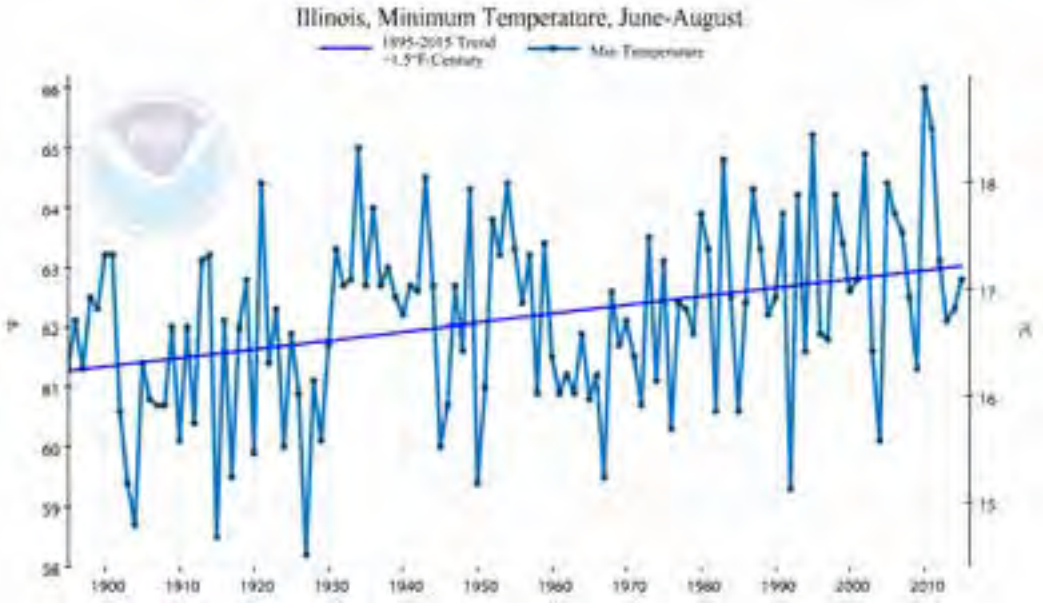

Illinois, Average Temperature, January-December
Avg Temperature
1895-2019 Trend +1.2°F/Century
°F
°C
56.0
55.0
54.0
53.0
52.0
51.0
50.0
49.0
13.0
12.0
11.0
10.0
9.0
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020

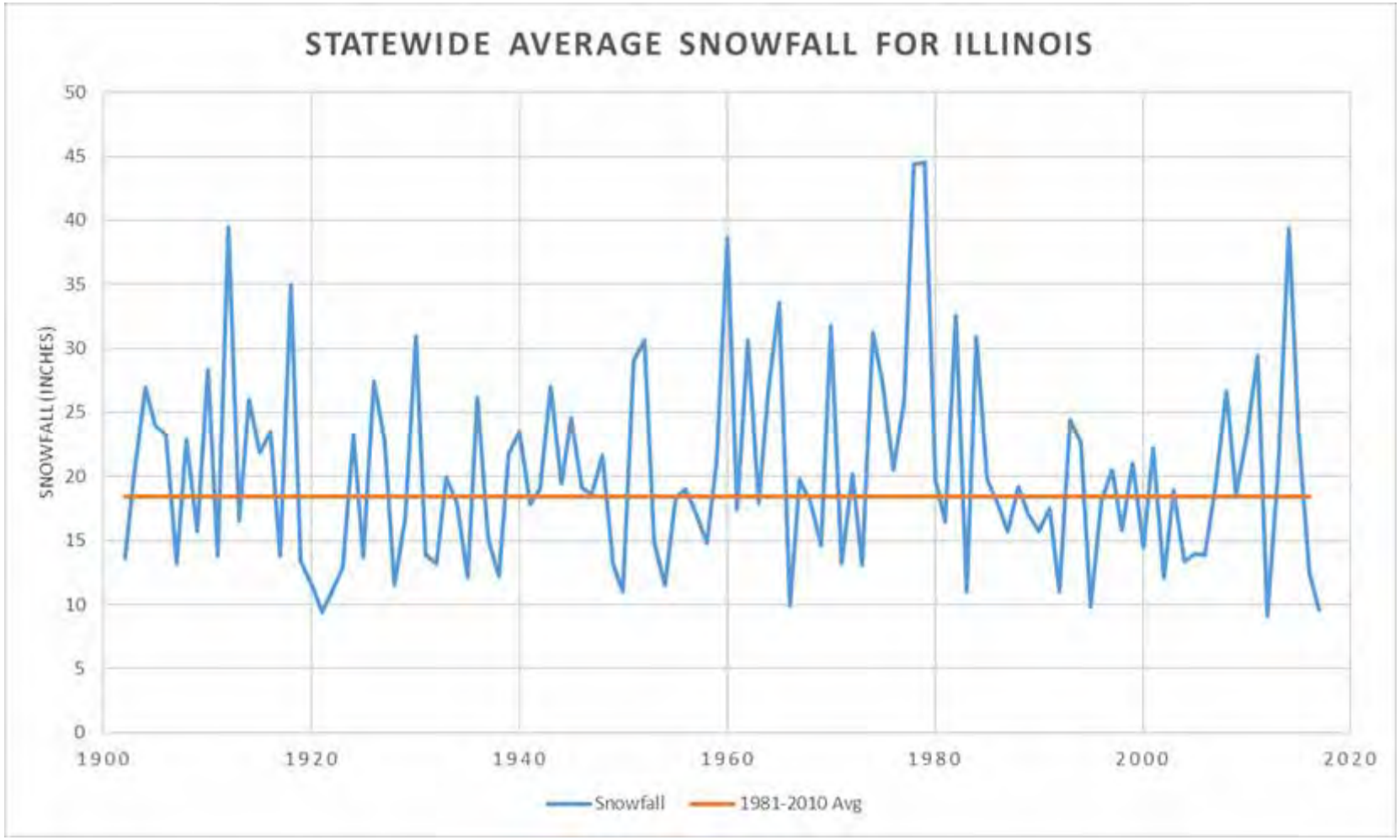
Summer Temperature



Daytime highs down

Nighttime lows up




STATEWIDE AVERAGE SNOWFALL FOR ILLINOIS
SNOWFALL (INCHES)
50
45
40
35
30
25
20
15
10
5
0
1900
1920
1940
1960
1980
2000
2020
Snowfall
1981-2010 Avg

Increased Pests and Invasive Species

Inland Floodwater Mosquito

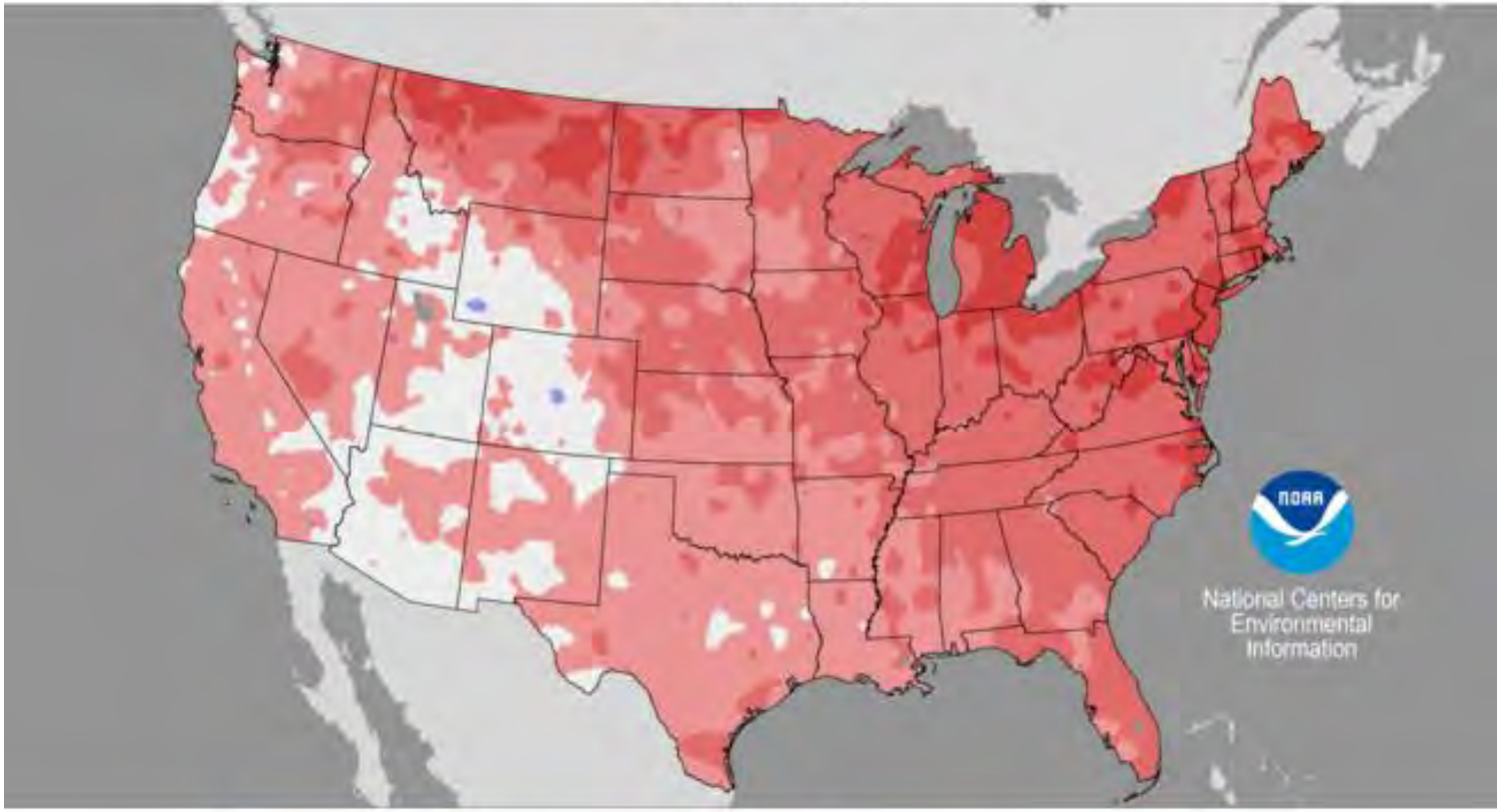
Climate Monitoring

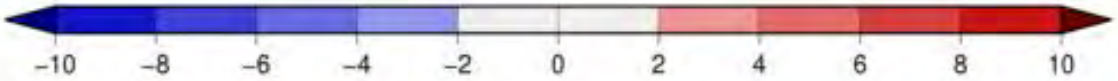
- Connecting the dots between weather and climate change

Mean Temperature Departures from Average

December 2019–February 2020

Base Period: 20th Century



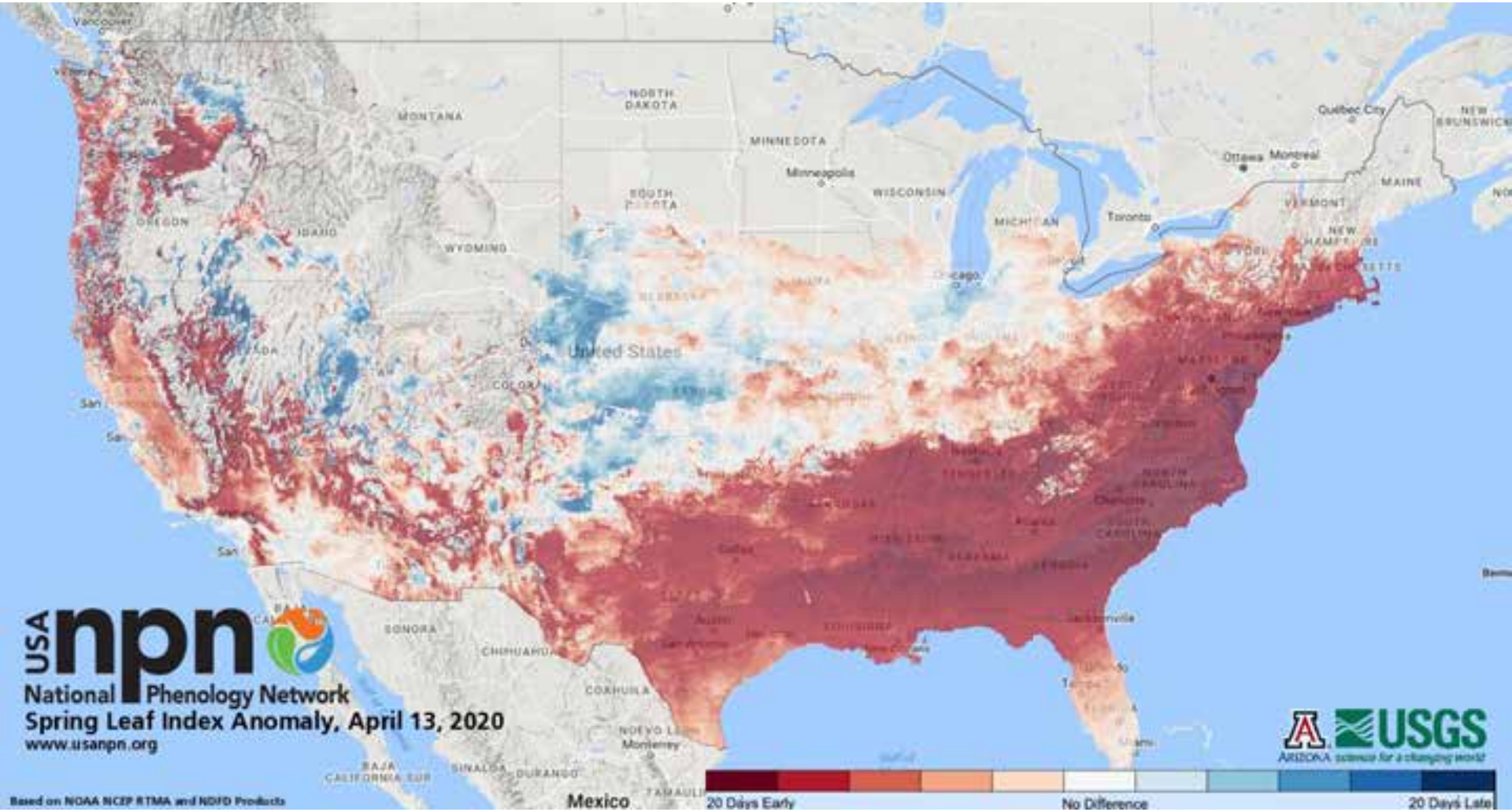


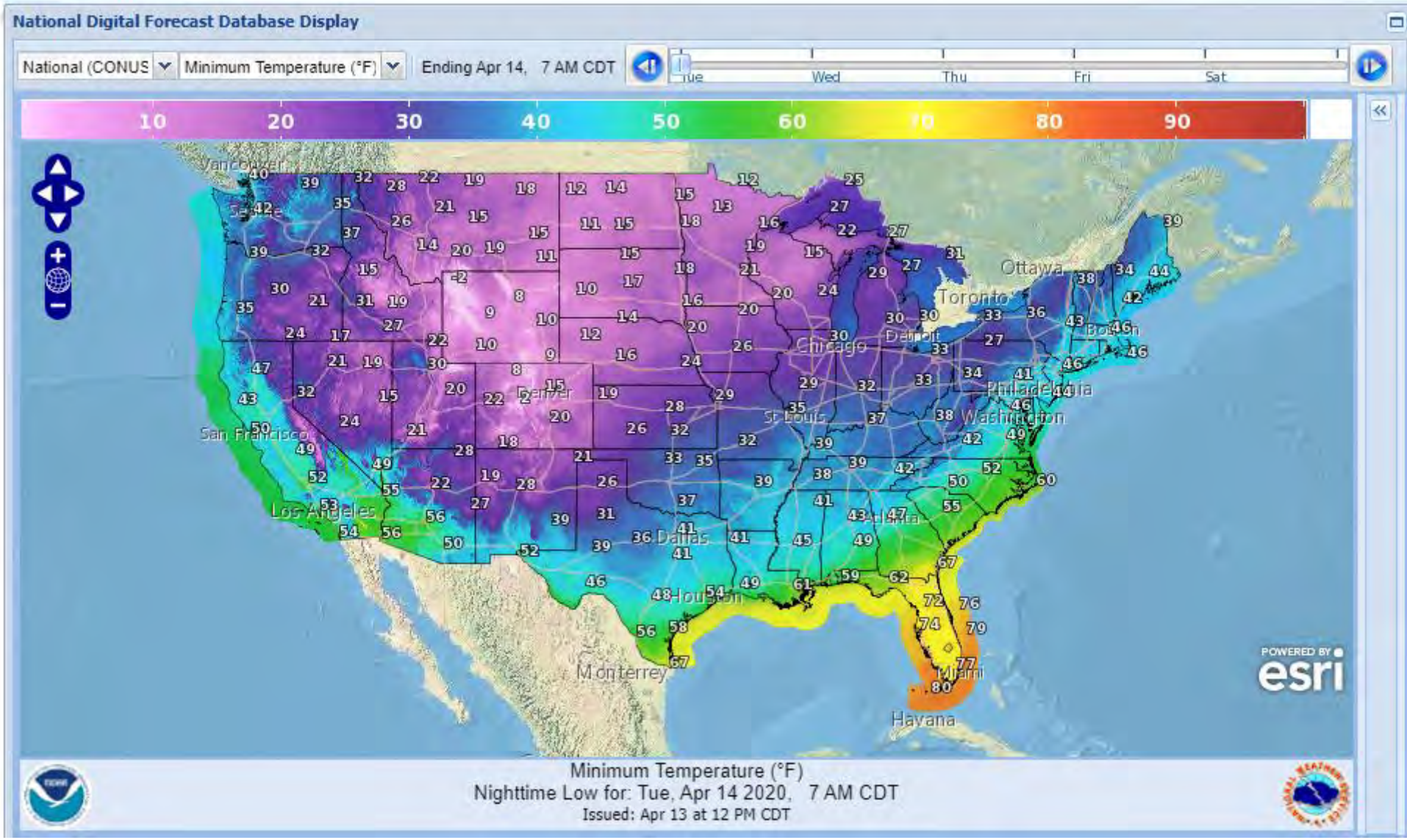
Created: Wed Mar 04 2020

Degrees Fahrenheit

Data Source: 5km Gridded (nClimGrid)

False Spring

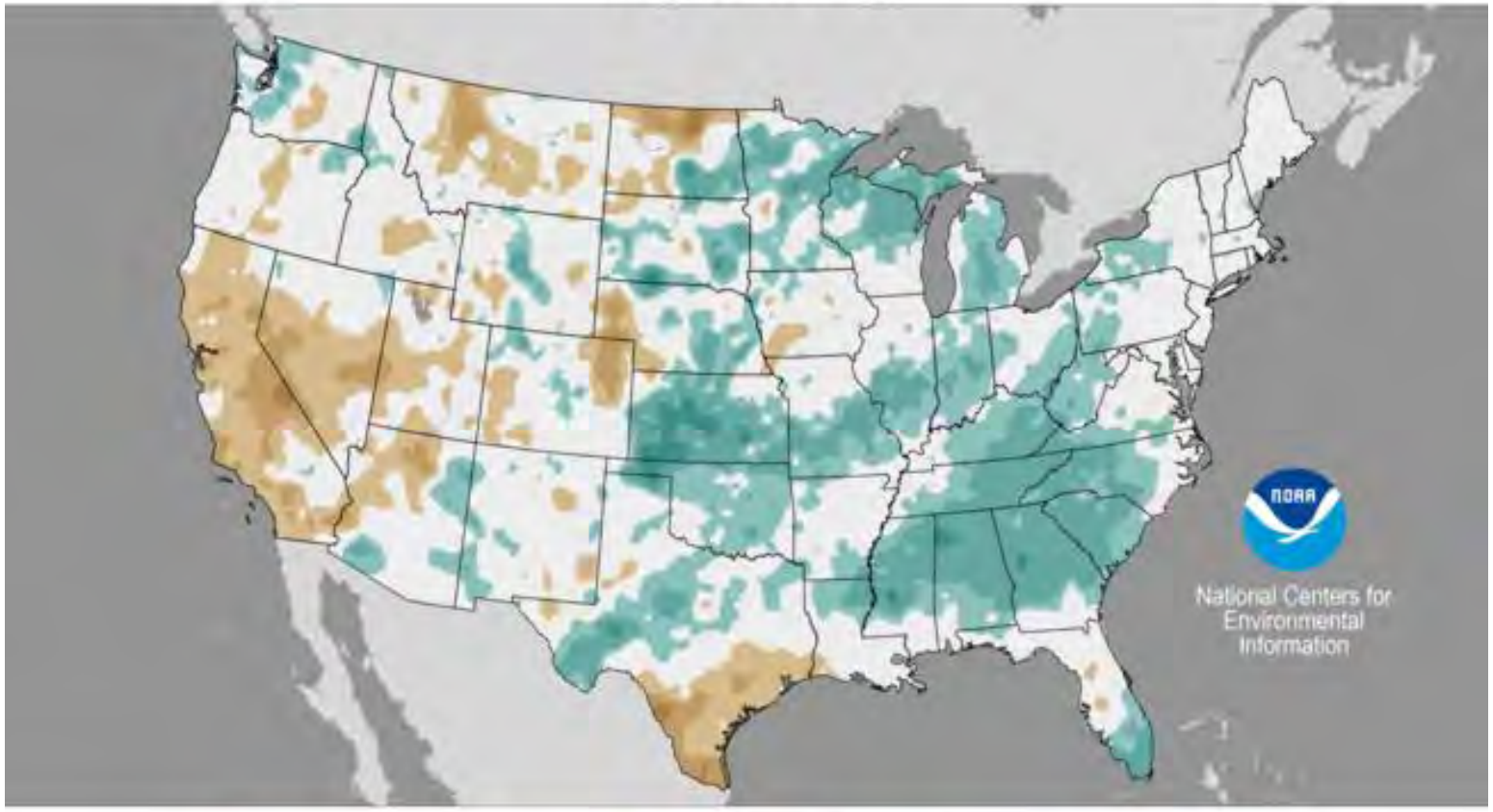



National Digital Forecast Database Display
National (CONUS
Minimum Temperature (°F)
Ending Apr 14, 7 AM CDT
Tue
Wed
Thu
Fri
Sat
10
20
30
40
50
60
70
80
90
Vancouver
Seattle
San Francisco
Los Angeles
Denver
Chicago
Detroit
Toronto
Ottawa
Boston
Philadelphia
Washington
St Louis
Dallas
Houston
Miami
Monterrey
Havana
POWERED BY esri
Minimum Temperature (°F)
Nighttime Low for: Tue, Apr 14 2020, 7 AM CDT
Issued: Apr 13 at 12 PM CDT

Precipitation Percent of Average

December 2019–February 2020

Average Period: 20th Century



5 10 25 50 75 100 125 150 200 300 500

Percent

Created: Wed Mar 04 2020

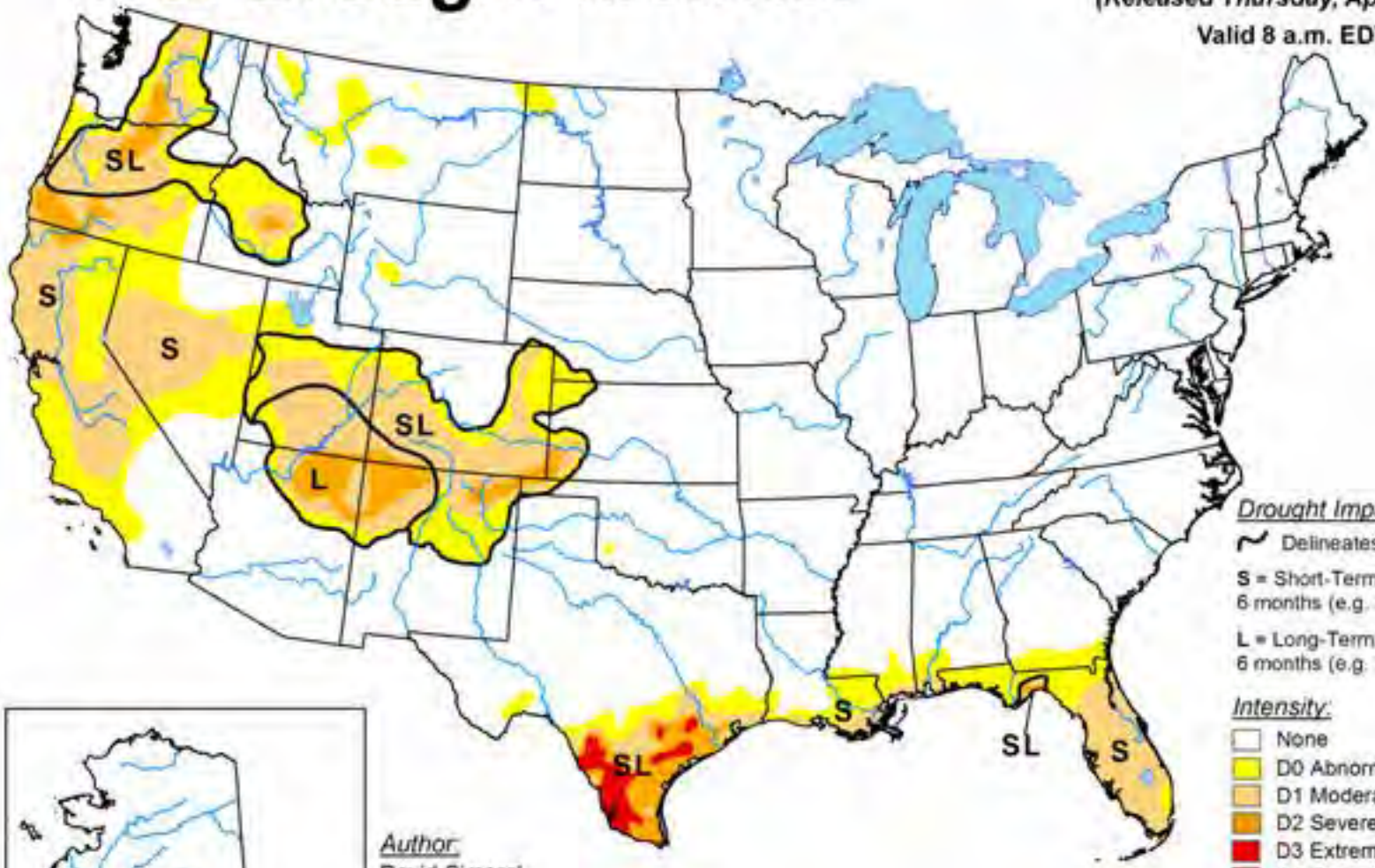
Data Source: 5km Gridded (nClimGrid)

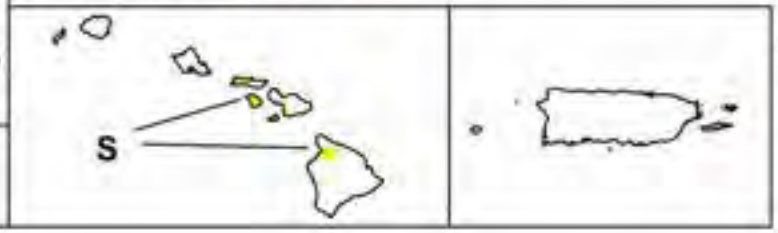
U.S. Drought Monitor

March 31, 2020

(Released Thursday, Apr. 2, 2020)

Valid 8 a.m. EDT





Drought Impact Types:

Delineates dominant impacts

S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:
David Simeral
Western Regional Climate Center

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

USDA NDMC

droughtmonitor.unl.edu

Examples of Mitigating/Adapting to Climate Change

Wetlands

Prairie Strips in CRP de Kok-Mercado and Katrina Ruff

Sources: Zhou et al. 2012, Helmers et al. 2012, Hernandez-Santana et al. 2013, Iqbal et al. 2014, Mitchell et al. 2014, Zhou et al. 2014

Flumes at Neal Smith credit Jose Gutierrez

Summary for Illinois

- **Already warmer throughout the year**
- **Concern moving forward with higher summer heat**
- **Overall wetter with more frequent and heavier rain events**

"Statisticallycartoon" on Instagram